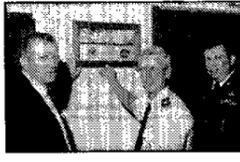




White Sands Test Facility, an important part of JSC, is pushing testing technology to its limits. Story on Page 3.



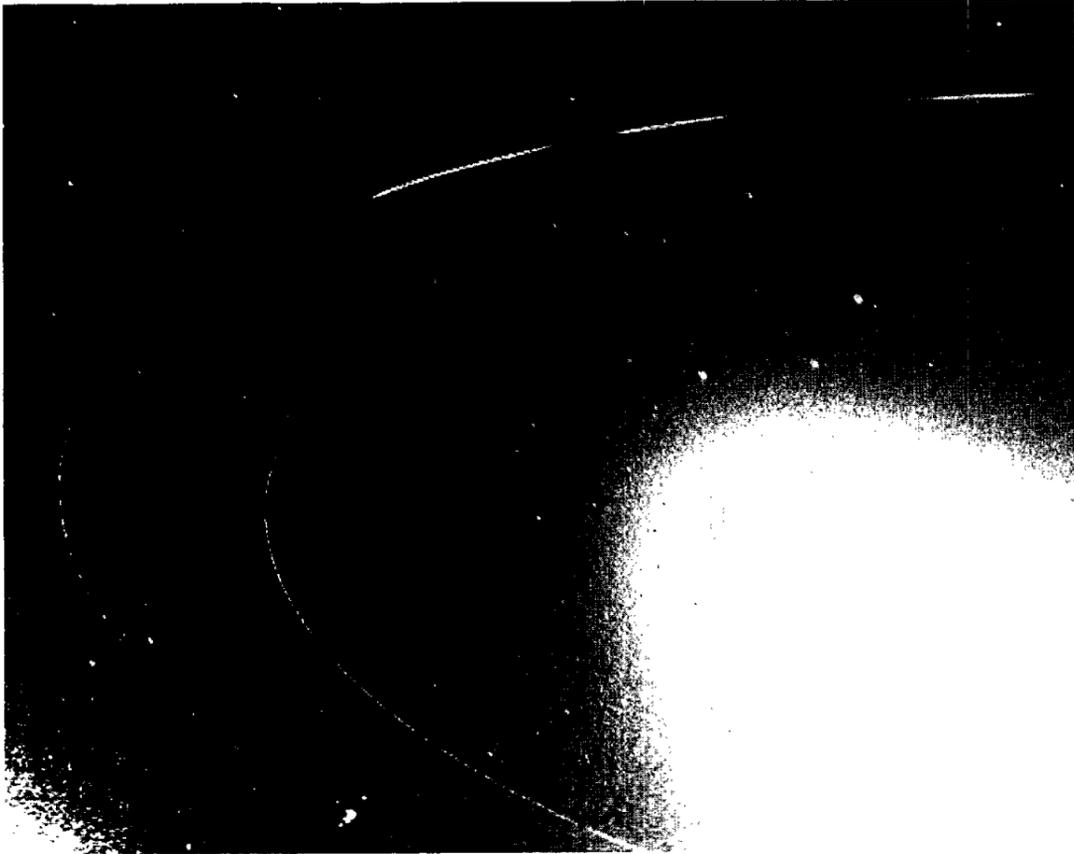
The Air Force's 1st Manned Spacecraft Control Squadron officially ended its four-year stay at JSC last Friday. Story on Page 4.

Space News Roundup

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No. 35



Voyager may take one last picture

After completing its "grand tour" of the outer solar system and chalking up an impressive list of accomplishments, the 12-year-old Voyager 2 may be called upon to take one last spectacular photograph—a "family portrait" of the planets.

Dr. Edward Stone, chief scientist of the Voyager project, said the optimum time for such a snapshot will be in six months.

"We are considering such a photo possibility," Stone said, "Although we may not get all the planets in the photograph."

As scientists at NASA's Jet Propulsion Laboratory conducted their final Neptune news conference Tuesday, the spacecraft was 2.76 billion miles from Earth and already 4.2 million miles past Neptune, traveling at 37,000 miles an hour toward the edge of the solar system and beyond.

Stone said scientists would continue to track
Please see **VOYAGER**, Page 4



NASA Photos
Above: Neptune's two main rings are backlit as Voyager 2 passes within 683,000 miles of the solar system's fourth largest planet. Right: Neptune's largest moon, Triton, shows signs of internally driven geologic processes that may have included ice volcano eruptions of nitrogen ice crystals 20 miles high.

Supercomputer adds powerful processing tool

By Linda Copley

JSC announced its entry into the world of supercomputing this week by signing a contract with Grumman Data Systems Corp. for an Engineering Computation Facility (ECF) Class VI Computer System.

"We've been working on getting one of these since 1982," said Pete Gillette, technical manager of the soon-to-be-realized Engineering Computation Facility. "And it's great to think we'll soon be processing computations 10 to 100 times faster than before."

The firm-fixed-price contract is for a period from Aug. 25, 1989 through Sept. 30, 1990, with a value of \$11.1 million. If all options are exercised the total firm-fixed price of the contract will be \$47.7 million for a period not to exceed 60 months.

"I am extremely pleased about the imminent delivery of this powerful computational equipment," said JSC Director Aaron Cohen. "Having this resource available to our engineers and scientists will multiply their effectiveness as we work to increase our shuttle flight rate safely and as we move forward with Space Station *Freedom* and planning for missions to the Moon and Mars."

The contract is a lease-purchase agreement, and includes installation and integration of the system components, as well as analyst support services. NASA will own the equipment at the end of five years, if all the renewal options are exercised.

Three thousand square feet on the second floor of Bldg. 46 are being prepared for the computing facility, including recently completed installation of refrigeration, plumbing, and electrical lines and three 150 horsepower motor generators weighing 8,600 each. The planned arrival of the Cray and Amdahl processors will occur sometime before the end of September.

The projected date of total system acceptance, according to Gillette, is Dec. 15. Standard performance tests will begin Nov. 15.

"The work involved just in doing the actual installation for this facility has been astonishing," he said. "We've had people working seven days a week since Aug. 21 just on the plumbing."

Gillette said the supercomputer complex is designed to be an institutional resource for addressing problems requiring large, fast computations. It will be used primarily by the science and engineering directorates to support current and future space programs.

The ECF will support day-of-launch wind loads computation, where the facility will provide a more timely and accurate "go/no go" decision for launch; liftoff loads analysis, where improved techniques will better define expected loads and provide a greater performance envelope; and thermal analysis for shuttle, space station and advanced programs, where the computer will allow more detailed and much larger integrated thermal math models and analyses.

Alden Mackey, deputy chief of the Structures and Mechanics Division, said the resulting improved analysis techniques "may allow us to eventually carry bigger payloads and fly in higher orbits aboard shuttle."

The supercomputer should allow better orbiter entry analysis simulation of contingency aborts; calculation of shuttle/solid rocket booster ignition overpressure; and assessment of advanced solid rocket motors' impact on launch vehicle loads.

ECF simulation results will provide insight into the loads and aerodynamic interference heating generated by vehicle modifications and new configurations; provide aerobrake designers with aerodynamic forces and movements, heat transfer, and pressure distributions on the vehicle; and provide predictions of the flowfield around a Crew Emergency Return Vehicle (CERV) to support engineering design and reentry trajectory.

The ECF also will assist the shuttle launch vehicle aerodynamics area with flowfield calculations of the complete launch vehicle geometry; enable the expanding graphics analysis capabilities of panel layout automated interactive design (PLAID) software to speed detailed animation for dynamics simulation; assist in JSC's orbital debris studies by allowing three-dimensional analysis; and permit comet debris particle tracking studies.

Atlantis rolls out to launch pad

By Kyle Herring

Space Shuttle *Atlantis* was loaded late Wednesday with its primary cargo—the Galileo interplanetary spacecraft—as preparations continued for its flight next month.

Atlantis, along with its solid rocket booster/external fuel tank stack was transported atop the mobile launch platform to launch complex 39B at the Kennedy Space Center earlier this week. By 8:30 a.m. CDT Tuesday, the launch platform was "hard down" at the launch pad, with *Atlantis* ready to begin final processing for a planned launch at 12:29 p.m. CDT Oct. 12.

OV-104's primary mission will be to deploy the \$1.4 billion Galileo probe on its six-year journey to Jupiter via Venus, Earth and the Sun. The elaborate trajectory will take advantage of the gravity at each planet and the Sun to pick up speed needed to propel it on the final leg of its journey to Jupiter.

Atlantis' four-mile trip from the Vehicle Assembly Building to the pad began at 1:02 a.m. Tuesday—two hours late because of some minor last-minute snags—and ended shortly after 8:30 a.m.

Power-up of the orbiter occurred Wednesday morning. Installation of Galileo and its IUS began on

time about 7 a.m. The installation took about one shift. Yesterday and today, technicians were scheduled to electrically and mechanically mate the payload to the orbiter.

Additional work at the launch pad includes an inspection of rubber "gask-o-seals" that serve as washers between the SRB ignitors that fire the boosters, and the motor case.

The seals are used to contain pressure during the start sequence of the boosters, called the ignition transient. A small, one-tenth of an inch depression was found in one of the seals on a booster from *Columbia*'s mission last month following recovery and shuttle managers want to make sure *Atlantis*' boosters are okay for flight.

Prior to moving to the pad, a portion of the Shuttle Interface Test was used to verify critical connections between the vehicle elements and launch platform.

The crew for STS-34—Commander Don Williams, Pilot Mike McCulley and Mission Specialists Shannon Lucid, Franklin Chang-Diaz and Ellen Baker—will travel by T-38 trainers to KSC for the traditional terminal countdown demonstration test (TCDT) on Sept. 13 with T-zero scheduled for Friday, Sept. 15.



NASA Photo
The Galileo spacecraft is lifted for mating with its inertial upper stage booster in the Vertical Processing Facility. The combination is now being installed in *Atlantis*' payload bay.

JSC contributions to women's program help agency shine

The contributions of JSC's Federal Women's Program (FWP) have been recognized as crucial to NASA's receipt of the Office of Personnel Management and the Federal Women's Interagency Board 1989 Achievement Award.

The selection of NASA as the agency that made the most progress during fiscal year 1988 toward the employment, advancement, recognition and retention of women "would not have been possible without the contributions of JSC," according to Assistant Administrator for Equal Opportunity Programs Harriett G. Jenkins.

In a related gesture, Shirley Price, currently managing the discrimination complaint area within JSC's Equal Opportunity Programs Office, received a certificate of appreciation for her
Please see **PROGRAM**, Page 4

JSC

Ticket Window

The following discount tickets are available for purchase in the Bldg. 11 Exchange Gift Store from 10 a.m. to 2 p.m. weekdays. A calendar of Employee Activities Association events is now available on the PROFS computer network.

General Cinema (valid for one year): \$3.50 each.

AMC Theater (valid until May 1990): \$3 each.

Sea-Arama Marineworld, Galveston (valid until Oct. 17, 1990): adults, \$8.15; children \$5.10.

Sea World (San Antonio, year long): adults, \$17.25; children \$14.75.

Palm Beach at Moody Gardens (valid until September 1989): adults \$2.75; children \$1.50.

Astroworld (valid 1989): adults, \$14.12; children under 4, \$11.99; Waterworld (valid 1989): \$8.15.

Six Flags (valid through 1989): \$14.12.

Texas Renaissance Festival (open every weekend from Sept. 30 through Nov. 12): adults, \$8.95; children \$4.95.

JSC

Gilruth Center News

Sign up policy—All classes and athletic activities are first come, first served. To enroll, you must sign up in person at the Gilruth Recreation Center. Everyone will be required to show a badge or EAA membership card. Payment must be made in full at the time of registration. Classes tend to fill up four weeks in advance.

EAA badges—Dependents and spouses may apply for a photo I.D. 6:30-9:30 p.m. Monday-Friday.

Defensive driving—Course is offered from 8 a.m.-5 p.m., Sept. 16 and Oct. 14; cost is \$15.

Weight safety—Required for use of the Rec Center weight room. Classes will be 8-9:30 p.m. Sept. 6 and 21; cost is \$4.

Aerobics and exercise—Both classes are ongoing; cost is \$24.

Tennis lessons—Beginning tennis lessons, Mondays 5:15-6:45 p.m. starting Sept. 11; six-week course is \$32.

SCUBA lessons—Class starts Sept. 18 and runs for 5 weeks; cost is \$45.

JSC

Swap Shop

Swap Shop ads are accepted from current and retired NASA civil service employees and on-site contractor employees. Each ad must be submitted on a separate full-sized, revised JSC Form 1452. Deadline is 5 p.m. every Friday, two weeks before the desired date of publication. Send ads to Roundup Swap Shop, Code AP3, or deliver them to the deposit box outside Rm. 147 in Bldg. 2.

Property

Lease: 2-1-2 condo next to NASA, W/D, fans, miniblinds, ice maker, storage, pool, no pets, \$450/mo. plus dep. 488-0719.

Sale: La Porte, 3-2-5-2A, 1.5 story, new paint in and out, new lights and ceiling fans, FPL, new carpet, 6/10 acre lot, apt. over gar., \$79,900. 471-8956.

Rent/Sale: Crystal Beach cabin, sleeps 7, A/C, close to beach, \$200 dep., \$325/wk., \$195/wknd. or sell for \$32,000. (409) 832-2582 or (409) 755-1638.

Sale: Meadow Green, 2-story trad., Village built, better than new, 4-2-5-2 plus study and game room, \$128,000. 486-1404.

Sale: 60 acres, 3 mi. from Karnes City, TX, on hwy. 80, 50 mi from San Antonio; El Campo, TX, lg. 2-story house, 1 1/2 lots w/ many fruit trees, 38 mi from bay. 783-9164.

Rent: Stalls/pasture, FM 517 and Hwy. 146, 40x60 barn, ponds, util. Trey, 280-4381 or 484-7834.

Sale/Lease: 10 acres, half mi. west of Hwy. 146 on FM 517, barn, shed, ponds, util. Trey, 280-4381 or 484-7834.

Sale: Heritage Park, 3-2-2 custom home, tile entry, windows LR/DR, custom kitchen, new deck and fence, \$58,500. Tony or Lori Emmons, 482-5139.

Sale: Friendswood/Sun Meadow Estates, wooded lot, bordered by stream and golf course on 2 sides, approx. 245' deep and up to 86' wide, util. on site, \$29,500. Doug, x32860 or 486-7412.

Rent: League City Newport Subdiv. 2 BR in 3-2 house, \$250/mo., split bills, non-smokers only, small pet tolerated. Russ, 554-5900.

Sale: Seabrook, 3.29 acres w/home, 2-1, secluded, \$95,000, owner fin. w/\$25,000 down. 532-4784.

Sale: League City, The Landing, 3-1-5-1.5, oversize landscaped yd., shade trees, lg. den, assume loan, 10.5% fixed, low equity, \$59,500. 280-2285 or 332-2358.

Sale: Pearland lot, Shady Crest Subdiv., .7 acres, approx. 140x260, trees, \$29,000. 485-6095.

Trade: Custom canyon view, 6 yr. old, west of Austin, want similar age, qual., w/in 20 min. of JSC. 471-8795 or 333-6083.

Lease: 2-1-2 condo, next to NASA, W/D, fans, mini blinds, ice maker, stor., pool, no pets, \$425/mo. plus dep. 488-0719.

Sale/Rent: El Lago, 4-2, lg. fen. lot, \$78,900 or \$895. 532-4237.

Sale: League City/Landing, 3-2-1, approx. 1,200 sq. ft., new carpet, backyard deck, \$52,500. 332-4341 or 282-2881.

Sale: League City, 2.06 acres, near schools, city water and sewer avail., owner fin. 554-6695.

Rent: Piper's Meadow, 2-2-2, lg. yd. 486-5659.

Sale: Friendswood, 3-2-2, lg. master and fam. rooms, great floor plan, \$66,500. 482-7102.

Lease: New Heritage Park, 3-2-2, like new, 5 yr. old, \$665/mo. plus dep., no pets, or sell for \$67,000. x35021 or 482-5615.

Sale: Cocoa Beach, FLA, oceanfront time-sharing condo, rated five-star, take over payments. Kelly, x31356 or 488-4870.

Sale: Seabrook, waterfront property, 100' x 125' on sm. bay, raised above flood level. 474-5558.

Lease: Kirkwood South, 4-2-2, sep. dining, paneled den, gas util., fenced, \$525/mo. 482-6609.

Sale: Seabrook, 3-2-2, new A/C, heater, carpet, roof, ceramic and quarry tile, many upgrades, approx. 1,800 sq. ft., all brick, both formals, lg. den w/FPL, never flooded, redwood

deck w/spa, \$72,900, assume at 9 7/8%, must qual. Richard, x30271 or 474-9334.

Lease: Sycamore Valley/Ellington AFB, 3-2-2, FPL, formal dining, inside util. room, miniblinds, fenced, \$625/mo. 482-6609.

Sale: Friendswood, Wedgewood Village, 2 lots, 70' x 185', owner fin. w/10% down. 482-5226.

Cars & Trucks

'79 Olds Cutlass Supreme Station wagon, new tires, brakes, paint, \$1,800. 488-7490.

'78 Dodge Maxivan, customized, A/C, new tires, runs good, 360 V-8, \$1,500, OBO. Dan, 282-4225 or 484-2777.

'87 Sterling 825 SL, all options, low mi., under warr., red ext. w/camel leather int., \$15,900. 486-1404.

'60 Chrysler Imperial 4 DR sedan, excellent for restoration, \$700, OBO. 921-7212.

'71 VW bug, rebuilt eng., runs good, \$1,300. 282-4059 or 480-9482.

'85 Pontiac 6000 LE, V-6, AC, PS/PB, cruise, tilt, pwr. windows, 33K, \$5,400. Matt, x34285 or 486-7260.

'87 Pontiac Sunbird GT, auto., A/C, pwr. windows/locks, cruise, tilt wheel, reclining bucket seats w/cloth upholstery, sport wheels, sport suspension, new brakes, AM/FM stereo cass., tinted windows, 30K mi. 486-4029.

'78 BMW 733, great cond., deep green w/gold pinstripes, gold int., gold mag wheels w/new low profile tires, sunroof, \$5,600. x36889 or 538-3038.

'84 Chevy S10 PU, 53K mi., 4 WD, great cond., \$5,500. 996-9058.

'78 Corvette, Silver Anniv. Edit., new paint, tires, brakes, 14K mi. on new Vette eng., 2-tone silver w/white int., T-tops, auto., AM/FM/cass., \$8,500. Richard, x30271 or 474-9334.

'80 Corvette, 46K, great int. and body, \$8,000. 334-6275 or 554-6831.

'85 Chevy Nova, 5 spd., A/C, AM/FM stereo cass., Michelin radials, ex. cond., 50K mi., \$3,900. x37292 or 480-3729.

'84 Chevy Celebrity, 4 DR, auto., A/C, pwr. windows/locks, cruise, tilt wheel, deluxe cloth uphol., reclining bucket seats, AM/FM radio w/tape deck, metallic brn., \$5,500. Edward, x36250 481-4889.

'68 Chevelle SS, 350, 4 spd., red, good cond., \$2,800. Neal, 331-3525.

'88 Camero, T-tops, louvers, pwr. windows, ex. cond., \$13,000. 534-4225.

'79 Honda Civic, 4 spd., no A/C, new tires, exhaust system, clutch, struts, CV joints, rebuilt eng., \$1,295. x33617 or 896-6347.

'78 customized Dodge van, 71k mi., ex. cond., \$2,250. 332-2229.

Boats & Planes

'81 G-Cat 19' catamaran, good cond. w/trlr., \$1,350. 333-7596 or 923-3973.

'77 Silver Streak T.T., 28', twin beds, rear bath, extras, \$12,000. 941-7994.

'78 Renken 19' Bowrider, 170hp fresh wtr. cooled Mercruiser I/O, galv. EZ loader trlr., depth finder, good cond., \$4,000. 532-3515.

16' Hobie cat, 2 sets of sails, harnesses, traps, life jackets, trlr. optional, BO. John, x38988 or 482-6364.

Gulf Coast 14 (Sunfish Clone) sailboat, good cond., \$325. Musgrove, x38356 or 488-3966.

22' Columbia sailboat, fix-keel, roomy cabin, head and sink, full sails, 6hp motor. x31588 or 488-1326.

'83 Wellcraft Step V-20 center console, 200hp Evin., Bimini top, built-in aerated bait well, radio, chart recorder, rod holders, Tandem trlr., \$11,500, OBO. 946-1527 or 487-8018.

18' Hobie Cat, galv. trlr., life jackets, many extras, \$1,875 or trade for power boat or PU. x31226 or 534-3710.

'74 Mastercraft classic ski boat, refin. in '86, teak accents. 283-6511.

Cycles

'84 Honda 650 Nighthawk, very low mi., like

Today

Cafeteria menu—Special: tuna and salmon Croquette. Entrees: pork chop with yam rosette, Creole baked cod. Soup: seafood gumbo. Vegetables: Brussels sprouts, green beans, buttered corn, whipped potatoes.

Monday

Labor Day holiday—The cafeteria, along with most JSC offices, will be closed.

Tuesday

Cafeteria menu—Special: stuffed cabbage. Entrees: turkey and dressing, round steak with hash browns. Soup: beef and barley. Vegetables: corn coblette, okra and tomatoes, French beans.

Wednesday

Cafeteria menu—Special: pepper steak. Entrees: catfish with hush puppies, roast pork with dressing. Soup: seafood gumbo. Vegetables: broccoli, macaroni and cheese, stewed tomatoes.

Thursday

Cafeteria menu—Special: chicken fried steak. Entrees: beef barbecue ham steak, Hungarian

Dates & Data

goulash. Soup: turkey and vegetable. Vegetables: spinach, pinto beans, beets.

Sept. 8

Cafeteria menu—Special: tuna and noodle casserole. Entrees: liver and onions, deviled crabs, roast beef with dressing. Soup: seafood gumbo. Vegetables: whipped potatoes, peas, cauliflower.

Sept. 13

MAES luncheon—The monthly luncheon meeting for the Mexican American Engineering Society will be held at 11:30 A.M., Sept. 13, at Mamacita's restaurant, 18206 Egret Bay Blvd. For information, contact Jose Reyes, x38974.

Sept. 20

Computer security expo—The Data Processing Systems Division (DPSD) will host a User Workstation Security Exposition Sept. 20-21 in the Product Demonstration Facility (PDF), Bldg. 12, Rm. 112. Exhibitors will display anti-viral, file encryption, data storage, access control, keystroke auditing and Local Area Network security products. For more information, call the PDF

at x37572.

Sept. 21

Business of Space symposium—The University Houston - Clear Lake's (UHCL) Management Association, Masters of Business Administration Association, and the Students for the Exploration and Development of Space is hosting a symposium entitled "The Business of Space: Case Studies," at 7 p.m., Sept. 21, in the UHCL's auditorium. Presentations from Barrios Technology, Space Services, Inc., and Space Industries, Inc. will be given, and a panel of several community industry leaders will critique the cases presented. A reception will follow in UHCL's Forest Room. The symposium is free to the public. Contact Peter Lange for more information at x30850 or 334-2081.

Sept. 26

BAPCO to meet—The Bay Area PC Organization (BAPCO) will meet at 7:30 p.m. Sept. 26 at League City Bank & Trust. For more information, call Earl Rubenstein, x34808 or 326-2354, or Ron Waldbillig, 337-5074.

new cond., sport fairing, cover, maint. manual, \$1,950. X39556 or 484-8326.

'86 Suzuki Savage, \$1,200; '85 Honda Rebel, \$800; both low mi., ex. cond. 488-7490.

'82 Honda Nighthawk 650, good cond., runs well, 11K mi., \$1,000 cash, OBO. Kelvin, x38905 or 488-8173.

'86 Honda 700 Interceptor VFR; gear-driven cam V4; like new, red, white, blue, matching helmet; garage kept, low mi.; \$3,500 neg. x31588 or 488-1326.

'73 Honda CB-175 motorcycle, low mi., great shape, needs work, \$150. John, x38178 or 482-5837.

Audiovisual & Computers

Commodore SX-64 portable computer, CPU, 5" color display, disk drive and several software pkgs, RO. Chris, x30794 or 941-0138.

Aston Tate's dBase for Macintosh; \$100, OBO. 280-8006.

IBM PC-AT clone, color EGA graphics, 40 MB HD, 1.2 MB floppy, 360K floppy, Star NX-10 graphics printer, free software, compl. system, \$1,500 firm. Charles x33599 or 474-9251.

PC/XT compat., 30 MB hard disk, 360 & 720 floppies, 640 KB RAM; 8087 coprocessor, mono flat screen, internal modem, keyboard, multi I/O amd color card. Sarah, 282-3386 or Kevin, 282-4871.

Household

Pitt group sofa, lg., steel blue, recliner on each end, less than 1 yr. old, ex. cond, paid \$1,200, will take \$850. Jan, 4870-8190 or 409-945-6894.

Captain style twin bed, 2 drawers underneath, matt, ex. cond., \$150. 280-8006.

Bookshelf, dark brown, 72" high x 28" wide, 3 lg. shelves, cabinet at bottom, BO. 480-2256.

DR set, china cabinet, table, 2 arm and 4 side chairs, pecan wood, \$3,700 value for \$950. 333-3187.

Anitque set of 2 tables, maple wood, perfect for LR/den, ex. cond., \$55; coffee table w/glass, \$35. Dot, x35274.

Couch, early American, brown tone, \$130; recliner/rocker, brown plaid, \$65. Ed, x36250.

Sewing machine, cabinet model, used very little, \$75. 946-7587.

Beveled glass-top rect. table, 1/2" thick glass, w/faux marble base, seats four to six, two mo. old, paid \$550, now \$280. Katie, x33185 or 996-8608.

European featherbed matt. & boxsprings, queen size, 3 mo. old, orig. \$1,100 sell for \$550. Robin, x38842 or 486-7726.

Three-pc. LR suite, brown w/floral cushions, his/her chairs; coffee table and end table, slate tops, \$125. Bob, x39378 or 332-4756.

Queen size sofa, w/reel matt., gold tinted floral pattern, ex. cond., \$150. Al, 283-5809 or 996-0501.

Lost & Found

Orange tabby long-haired cat, needs medicine, NASA area. 480-1045 or 483-5393.

Photographic

Omega DII 4 x 5 enlarger w/variable condenser head, 50mm, 90mm, 135mm enlarging lens and corresponding negative carriers. Pete, x38572 or 946-6248.

Polaroid back 4 x 5 format single sheet, \$75; Graflex roll film back, 6 x 7cm for 4 x 5 graphic camera, \$75; 4 x 5 Grafmatic w/six septums, \$35; 4 x 5 cut film holders, \$7.50. 946-8248.

Pets & Livestock

Free decaud, neutered house cat, approx. 1 year old, good w/children. Elaine, 283-5401.

Free kitten, tabby - BL/BR & cream, fem., 5 mos. wormed and 1st shots; cat, sm. fem., 2 yrs, solid black, spayed & shots. 280-9956.

Doberman pups, all shots, wormed, 3 fem., 1 male. Lois, (409) 935-8745.

Raindoves, brown ringnecks, \$3 ea. and white, \$5 ea. Clarence Blume, x38820 or 554-2911.

Kittens, CFA reg., tortoise shell, black, orange

colors, 5 mo-6 wks, \$150 to \$300. 480-5954.

Wanted

Want wrought-iron patio set. x36796.

Want reliable babysitter for 3 mo. old, Alameda Mall area, transportation helpful. Chris, x30794 or 941-0138.

Want Fuzzbuster or similar type radar detector. John, 486-4403.

Want reliable, neat, nonsmoking female to share my home, \$120/mo. plus 1/2 util. Your housebroken dog is welcome, if compat. w/mine. Kathryn, 280-9040.

Bay Area Club wants to lease a few good, clean airplanes, based at Houston Gulf airport, we pay liability insur. and tiedown. Pete Frank, 474-2384 or Earle Crum, 326-1953.

Want 2 roommates to share house in League City, Newport Subdivision, \$250/mo., split bills, non-smokers only, sm. pets tolerated. Russ, 554-5900.

Want graduates from Rochester Institute of Technology (RIT), any major. John, x31893 or Seri, x32243.

Quiet, female professional wants to rent BR study and BA in house or apartment w/in 15 min. of JSC. 483-4952.

Riders needed, van pool, West Loop Park and Ride to NASA. Richard, x37557.

Rhythm section looking to form original band, want sax, guitar, keyboard, singer, etc., some experience desired. Bill, x35506 or 480-2524.

Want Starwars spaceships, toys, figures & books. Ron, 482-1385.

Musical Instruments

Peavey In11 115 speaker cabinet, \$190, Yamaha RX7 drum machine, \$450. Joe, 996-1667.

Ludwig wooden snare drum, black, 6 1/2 x 14, new, \$140; Zildjian cymbals, 20" medium ride, \$90; 20" swish w/o rivets, \$100; Tama hi-hat stand, \$25. Joe, 996-1667.

Alto sax, Vito, \$300 OBO. 488-1318.

Conn trombone, ex. cond., \$175. Tony, 280-1564 or 482-4156.

Fender jazz bass guitar w/hardshell case, Sunburst, was \$1100, now \$595, will finance. x33617 or 896-6347.

Miscellaneous

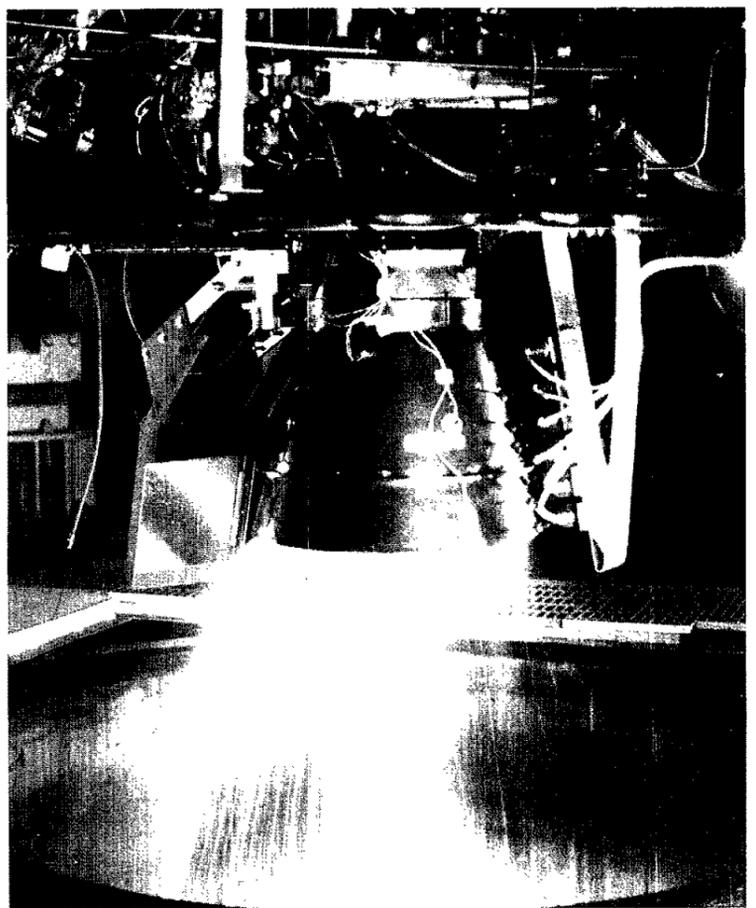
Bassett crib, cradle, baby clothes, shoes 0-18 mos., washing machine, lawn mower needs work, more. 996-8410.

Lloyds AM/FM stereo and record player, 2-speakers, good cond., \$50. 946-7587.

Child's carseat, \$7.50; rocking horse, \$30. 482-1505.

Antique small dresser w/oval mirror, \$70. 482-1505.

Tour Model III \$18.20/iron, metal woods, \$30 ea. David, 5



Pushing testing technology to its limits

[Editor's note: This is the last of two articles on White Sands Test Facility, 60,000 acres of desert near Las Cruces, N.M., that people sometimes forget is an important part of JSC.]

By James Hartsfield

WSTF is self-sufficient in many ways due to its distant location from JSC, its parent center. The facility employs about 580 workers, about 60 of them NASA civil servants and the majority of the rest employed by Lockheed Engineering and Sciences Co.

The facility is divided into three areas: the Administrative Area, the Propulsion Test Area and the Laboratories Area, where materials testing is done. The Tracking and Data Relay Satellite System (TDRSS) Ground Terminal is located adjacent to WSTF, but the two facilities are separate entities, with the TDRSS terminal managed by Goddard Space Flight Center.

Although WSTF mainly serves the testing requirements of JSC, it also does extensive testing for other NASA centers. In addition, it conducts tests for other government agencies, including the Army, Air Force, Navy, Department of Energy and Department of Transportation, as well as for aerospace-related commercial industries on a cost-reimbursable basis.

Two separate test complexes make up the Propulsion Test Area; one area was originally built to handle testing of the Apollo Command and Service Module engines, while the other was built to test the Lunar Module engines. The various engine test stands at WSTF include four altitude chambers that can

simulate the vacuum of space during an engine firing. To maintain a vacuum during a firing, WSTF has one of the largest steam ejector systems in existence. Steam is accelerated by the system to supersonic speeds, and, as it is ejected, it creates sufficient suction to pull a rocket's exhaust out of the enclosed test stand, maintaining a simulated altitude equivalent to being above 99.5 percent of Earth's atmosphere. In addition to the altitude chambers, WSTF also has three test stands that operate at normal, or ambient, atmospheric pressure.

Several specialized test stands at WSTF include an altitude chamber built to fire solid rocket motors (SRMs) used to deploy satellites, a difficult task because SRMs usually spin as they are fired. An SRM up to 48 inches in diameter can spin up to 125 revolutions per minute in WSTF's stand while generating over 10 tons of thrust. Another test stand has been equipped to handle engines fueled by super-cold liquid hydrogen and liquid oxygen.

Current propulsion work at WSTF centers around continued testing of the shuttle's OMS engines and RCS thrusters. Recently, the facility has received tentative approval to work toward a fleet-leader program for the shuttle, said Joe Fries, Propulsion Office chief. Simply put, the fleet leader concept means WSTF will put more operating time and cycles on its OMS and RCS test articles than are on any of the flight systems, in an attempt to uncover

problems that may be associated with extended use.

The future holds many challenges for White Sands. Space Station *Freedom's* on-orbit propulsion system will be tested there, as will new and exotic propellants, such as gelled and metallized fuels, and more standard, but higher performance, propellants such as liquid oxygen and liquid hydrogen. The testing of SRMs also should increase.

"Our propulsion tests usually involve testing the whole system put together. Contractors may have tested all the individual components, but we test how they interact," explained Fries. "Our main function here is to find out how it all works together."

Propulsion testing at WSTF often also includes developing procedures for handling rocket propellants. "We usually must ensure that the procedures for loading propellant on a vehicle such as the shuttle are the correct ones," Fries said. "Our testing isn't all just fire and smoke."

In materials testing, WSTF's work currently focuses on materials proposed for use on the shuttle and space station as well as innovative experiments checking the results of orbital space debris impact and metals' flammability.

Also, the labs often analyze shuttle parts that have failed during a mission to try to mimic their failures and, from that, find the specific problem. Such parts can range from high-pressure pumps and valves used in rocket engines to semiconductors.

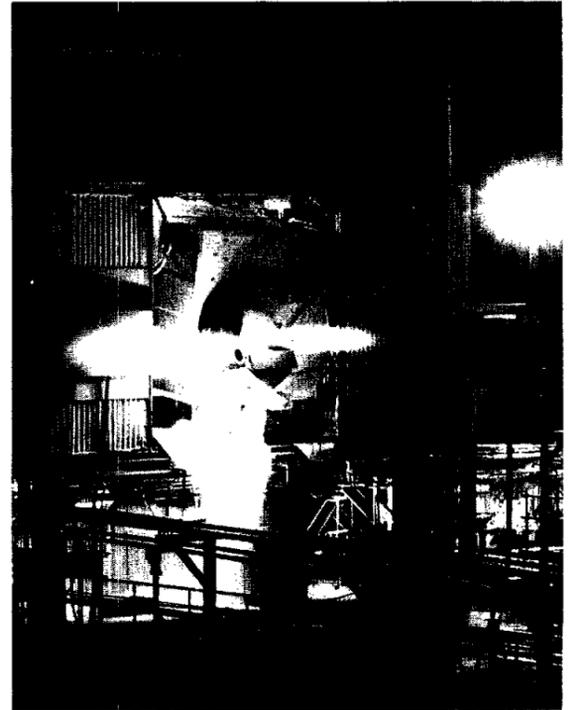
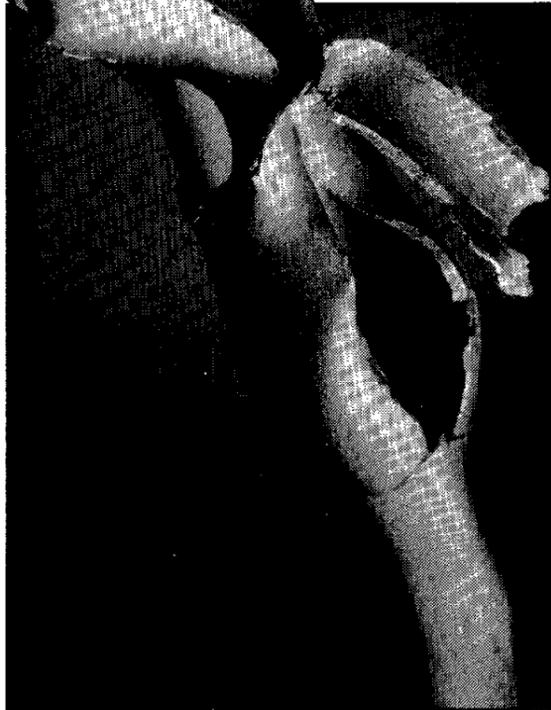
"It's a very exciting thing: to see

a need, develop a test that will fit that need and then see the results," Pippen said. "We're all pushing toward a common goal. There's a challenge in pushing technology to its limits, and that's what we really enjoy doing. It's just that our technology happens to be in the testing world."

WSTF labs have facilities to provide the precision cleaning necessary for potential spacecraft parts, including a Class 100 clean room. During Apollo, the precision cleaning at WSTF was used to make certain the tools used on the Moon and in the Lunar Receiving Lab at JSC were totally free of terrestrial contaminants. They also were used during the Viking program to ensure that the Mars landers' soil-sampling probes were free of Earth contaminants.

Many of the tests WSTF performs for NASA or other entities are unique and need specialized equipment, often designed and built locally. For this reason, the many facilities and tasks at WSTF are dynamic and change on a continuous basis. A light-gas gun was recently constructed at WSTF to supplement the hypervelocity orbital space debris impact studies done at JSC. The space debris work at WSTF will involve impacts on pressurized containers, work unsuitable at JSC.

"What we want is a world-class lab," Pippen added. "That means to me that people all over the world look at us as experts in a given field, and we're tapping on the door. We get calls from all over. It's a very satisfying thing professionally to have people call you from all over and say, 'We heard you guys were the experts.'"



NASA Photos

Testing, test equipment and test articles are the binding ingredients of the work at White Sands. Examples include, clockwise from top left: 1) a steam generator system using three modified X-15 rocket engines to simulate altitudes of more than 100,000 feet during engine tests in test stand 401; 2) testing of the Department of Defense's first anti-missile missile in a 1980 Homing Overlay Experiment; 3) qualification testing of the space shuttle aft reaction control system in 1978, using multiple short firings; 4) documentation of a 20,000 psi (pounds per square inch) drain line destroyed through hydrazine detonation during an immersion test; and 5) technicians Thomas Rethwisch, left, and Robert Sanders using a sophisticated computerized electronic control and data acquisition system to monitor more than 600 simulation parameters.

Link to negotiate for Training Services Contract

NASA has selected Link Flight Simulation Division, CAE-Link Corp., Houston, for negotiations leading to the award of a possible 10-year, \$477 million contract for technical and engineering services for Mission Support Directorate training systems at JSC.

The proposed cost-plus-award-fee Training Services Contract (TSC) consists of a basic period of six years with priced options for four additional one-year periods. The contract is expected to be awarded in October.

JSC Clinic will offer flu shots September 25

The JSC Clinic will be offering flu vaccinations again this year.

Influenza vaccine inoculations will be available from 10 a.m.-noon and from 2-4 p.m. Sept. 25 at the clinic in Bldg. 8. Vaccinees will be asked to sign an informed consent form, and will have an opportunity to ask questions.

Influenza viruses are unique in their ability to cause periodic widespread outbreaks of feverish respiratory disease in both adults and children. The Center for Disease Control Immunization Practices Advisory Committee advocates vaccinations to anyone who wishes to reduce their chances of contracting the flu.

High-risk individuals, those with heart disease of any type, chronic broncho-pulmonary disease such as asthma, chronic bronchitis and emphysema, and diabetes mellitus are urged to consider taking the vaccine.

For more information, call the clinic at x34111.

Simulation papers sought

The Society for Computer Simulation Southwestern Regional Council has issued a call for abstracts to be presented at the Southwestern Simulation Conference, scheduled for Sept. 27-28 in JSC's Gilruth Recreation Center.

Presentations are invited on parallel processing; real-time, discreet, continuous and object oriented simulation; CASE tools; artificial intelligence; neural networks; aerospace and control applications; simulation in Ada; and training simulators.

Deadline is Sept. 8. Abstracts should be sent to SCS, P.O. Box 980425, Houston, TX, 77098. Preliminary contact with Matt Dougherty, 747-5433, or Wade Webster, 283-5087, is advised.

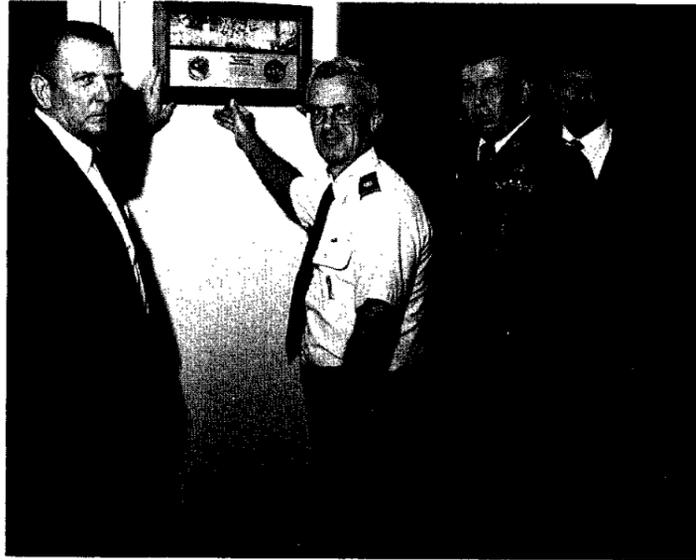
CAE-Link is a wholly owned subsidiary of CAE Industries Ltd. of Toronto, Canada.

Deputy Procurement Director J.P. Harris said the TSC procurement was competitive, involving four prime proposals, with each having from one to four contractors teamed with the prime offerer.

"Three of the four proposals were selected to be in the competitive range," explained Harris. The three firms were invited to bring in their key personnel and have discussions with

the Source Evaluation Board followed by the submission of their best and final offer.

"The Johnson Space Center training systems require the world's most sophisticated simulation," said Jon E. Forbes, president of CAE-Link Corporation. "Link's long relationship as a NASA team member, and our experience integrating multiple simulator programs ideally suit us for this important task. In effect, we have spent the past half-century preparing to assist NASA into the next century."



Mission Operations Director Gene Kranz (left), assisted by U.S. Manned Space Flight Support Group Commander Gotthard Janson, current 1st Manned Spaceflight Control Squadron Commander Ed Muniz, and former Commander Louis Jones, hang a plaque commemorating Air Force MOD activities in Bldg. 30.

Air Force says goodbye

The 1st Manned Spaceflight Control Squadron (1st MSCS) officially ended its four-year presence at JSC last Friday with ceremonies in the Mission Control Center (MCC).

Mission Operations Director Eugene Kranz presented a plaque to retiring 1st MSCS Commander Ed Muniz commemorating the squadron's participation in the MOD program. Muniz, the squadron's last commanding officer, immediately returned the plaque to Kranz, to be placed on the wall in Bldg. 30's Action Center.

"Our purpose for being here was to train as controllers," Muniz said. "Now that that type of training is no longer appropriate, it will just make room for other relationships (between the Air Force and NASA)."

The 1st MSCS was formed in December 1985 as the Air Force's only unit working with NASA to conduct shuttle and Department of Defense (DOD) payload flight operations. Its mission was to support

high priority national security missions, and to direct, develop and plan new and evolving manned spaceflight programs.

1st MSCS flight controllers trained at JSC were to staff the Air Force's planned Shuttle Operations Center in Colorado Springs. With the cancellation of the Air Force's Shuttle Operations and Planning Complex program, 1st MSCS's mission ended and the squadron was deactivated this June.

Several of the controllers in the program who trained at JSC, however, were able to resign or retire from the Air Force and are currently working as NASA civil servants, including Flight Directors Chuck Shaw and Chuck Knarr.

In recognizing the contributions the squadron had made to the shuttle program, Kranz noted the 1st MSCS were "truly members of MOD — and, being Air Force, would have to find a way to get back into the air sometime."

Link's major subcontractors include IBM Corp., Federal Systems Division, Houston; Booz-Allen and Hamilton Inc., Bethesda, Md.; and Eagle Technical Services Inc., Webster, Texas. IBM has responsibility for information systems definition, onboard computer and data management simulation. Booz-Allen will focus on space flight operations engineering and integration, and Eagle's role is competition advocate and design validator.

Science Applications International

Corp. (SAIC), San Diego, Calif.; Ford Aerospace, Houston; and Planning Research Corp., McLean, Va., also bid.

Services provided by the contract will include upgrades to the Shuttle Mission Training Facility in Houston, developing training facilities for Space Station *Freedom*, and development of training systems in support of the National Space Transportation System program, Space Station *Freedom* program and future programs.

Tape support supervisor earns Partnership Award

Art L. Bynam, group supervisor of Rockwell's magnetic tape cleaning/certification facility, received this quarter's JSC Quality Partnership Award from Acting Center Director Paul Weitz on Aug. 22.

The award, established by the Safety, Reliability, and Quality Assurance Office, recognizes the quality-related contributions of employees not currently



Bynam

working in the quality field.

Bynam was recognized for the daily dedication and effort he and his employees put into the overall tape support program. During 1988, Bynam and his team processed 94,000 tapes. Projections for 1989 call for the processing of more than 100,000 tapes, while reducing the cost from \$1.81 to \$1.56 per digital tape.

Bynam also was cited for designing a new tape cleaning facility layout, strategically procuring new equipment, and devising statistical process control methods to monitor and certify tape products.

Threshold Group plans meeting

JSC's Threshold Group will hold a general information meeting at 4:30 p.m. Wednesday in the Bldg. 30 auditorium. The Threshold Group is an organization of civil service professionals committed to making contributions to JSC and NASA's future beyond the requirements of their jobs.

Organizational activities since The Threshold Group's formation in May of this year include establishing a peer adviser group, technology development program, tours and lectures committee, white paper

study groups, and a forum to assist in the retention of corporate knowledge. In addition, participants help in new-hire orientation, and with the JSC speakers bureau.

The meeting will also give those interested in joining Threshold an opportunity to ask questions and suggest new activities they'd like to see the organization participate in.

For more information on The Threshold Group or the Sept. 6 meeting, contact Diane DeTroye at x33071 or Dorothy Schuster at x31530.

Bay Area Chorus seeks singers

The Bay Area Chorus is looking for new members as it prepares to begin its new season on Sept. 10.

Harley Weyer, of JSC's Aircraft Operations Division, said the chorus will sing its annual Christmas concert in Teague Auditorium on Dec. 10.

Many JSC employees sing with the chorus, which rehearses every Sunday at Webster Presbyterian Church from 6:30-9:30 p.m., Weyer said. Try-outs will be at 2 p.m. Sept. 9 at the church. Contact Weyer at x39637 or 333-5585 for more information.

Leland food drive successful

Last week's food drive at JSC netted 800 to 1,000 pounds of food, according to Bob Jenkins, the organizer of the effort.

Jenkins, a JSC reliability engineer, said the food was delivered to the Houston Food Bank in care of St. Bernadette Catholic Church for distribution to inner city pantries.

Jenkins said Sister Kathy McNulty has written a letter expressing thanks

to all the JSC and contractor employees who contributed. He added his own thanks.

The food drive was organized in memory of the late Rep. Mickey Leland by Jenkins, Damon Wilson, Quarance Patin and Marcellus Rowe in association with Deputy Human Resources Director Harvey Hartman and the Employee Activities Association.

Program lauded for aiding women

(Continued from Page 1)

'exemplary dedication' as former manager of JSC's Federal Women's Program, "which resulted in NASA being the 1989 recipient of the award."

Jenkins, in a congratulatory letter to JSC Director Aaron Cohen, cited the following accomplishments for women at JSC as being significant during the award period. First, the increase in the representation of

women at JSC in the GM-15 grade level, including a minority female, and in the scientific and engineering occupations; and secondly, the outstanding accomplishments of the FWP committee to educate managers, supervisors, and employees about the employment concerns of women through the continued observance of Federal Women's Program Week.

Finally, Jenkins recognized JSC's continued support of the annual agencywide Women in Science and Engineering Scholarship Program. In the program, full academic grants are awarded to two minority female high school seniors in the local area of each NASA center. Recipients are enrolled in the science and engineering program at Spelman College in Atlanta.

Voyager returns answers to six main Neptune questions

(Continued from Page 1)

Voyager for as long as possible, certainly over the next few years. Voyager, powered by radioisotope thermoelectric generators (RTGs), which turn the heat of decaying plutonium into electricity, should have enough fuel to function for another 25 years after mission controllers power down some systems to conserve power.

Voyager made its closest approach to Neptune on Aug. 24, coming within 3,000 miles of what currently is the outermost planet in the solar system. The next day, it whisked past Triton, coming within 24,000 miles of the pinkish, icy moon. During its close encounter with

Neptune, Voyager 2 discovered six new moons, bringing the total known to orbit the planet to eight. It confirmed the existence of Neptune's magnetic field, and was bombarded by dust as it later flew through the field.

On retrograde Triton, it discovered signs of ice volcanoes that may have erupted as recently as 100 years ago, spewing nitrogen ice particles and gas 20 miles high.

Stone said scientists were seeking the answers to six basic questions about Neptune through Voyager 2:

Q: Does Neptune have a magnetic field, and what is it like?

A: Neptune has a magnetic field that is tilted 50 degrees from the planet's rotation axis and is offset 6,000 miles

from the center of the planet.

Q: What is Neptune's rotation period (the length of its day)?

A: Neptune's interior rotates once in 16 hours, 3 minutes, Stone said. The measurement has nothing to do with rotation of features in the cloud tops.

Q: What are the weather systems on Neptune?

A: Neptune has a series of dark spots, most notable of which is the Great Dark Spot, which appears analogous to Jupiter's Great Red Spot. Bright cirrus clouds circulate high in the atmosphere. Winds blow retrograde at 700 mph, the fastest retrograde winds Voyager has seen. The temperature profile appears to be similar to that of Uranus.

Q: How many satellites does Neptune have and what is their geologic history?

A: Voyager found six new satellites. (Two, Triton and Nereid, were known before.) All new satellites are very dark, all have irregular shapes, and all of them seem to have undergone little or no geologic modification.

Q: How many ring arcs does Neptune have and how do they work?

A: Neptune has ring arcs, but they are just parts of complete rings. There are three separate rings and one broad sheet of particles. The particles are not of a single size, but a broad range of sizes.

Q: How big is Triton, and what is its geologic history?

Q: Triton's radius is 845 miles. Its density is 2.02 to 2.03 grams per cubic centimeter (the density of water is 1 gram per cubic centimeter). Triton contains more rock than other icy satellites and evidence of a remarkable geologic history. Signs of icy volcanism indicate it may have continued to modern times.

Triton's relatively high density, compared to other icy satellites, and its retrograde orbit constitute strong evidence that Triton did not originate in its present location, but was captured by Neptune early in the history of the solar system.

"Triton is a lot like Pluto," Stone said, "and will probably be our best look at Pluto for a long time to come."